## Asymmetric capillary wave fluctuations of a hexane film on a liquid surface

*M. Li, A.M. Tikhonov, S.V. Pingali and M.L. Schlossman (UIC)*

Abstract No. Li2141
Beamline(s) **X19C**

The thermodynamics of a liquid film on a liquid subphase is determined by the interfacial interaction potential. If the potential has a minimum for a finite film thickness, *d*, then one observes a partial wetting layer on top of the liquid surface. The thermal fluctuations of the interface result in asymmetric interfacial profiles because the interfacial potential is asymmetric near its minimum. X-ray reflectivity can probe these features by monitoring the increase of the period of the interference fringes with $Q_z$. The interference is between x-rays reflected from the top and bottom of the layer, that is, $\cos[q_z d - q_z^3(K_2^{(3)} - K_1^{(3)})/6]$ where $K_i^{(3)} = \int z^3 (d\rho_i / dz) dz$ and $r_i(z)$ is the electron density profile across the interfaces [1]. If r(z) is asymmetric, the period of the fringes will become $Q_z$ dependent. The figure illustrates the x-ray reflectivity of a hexane film spread on a 3.0M brine solution ($T$= 22°C). The period of the interference fringes increases rapidly as $Q_z$ increases. The hexane layer is reported to have a critical wetting transition several degrees above 22°C [2]. The interfacial potential is expected to become very asymmetric as the wetting transition is approached. This explains the strong asymmetric effect recorded in our data. Further work is in progress to confirm this measurement and determine the interfacial profiles.

[1]. M. Tolan, *X ray scattering from soft-matter thin films*, STMP series, vol. 148, Berlin, Springer 1999.
[2]. N. Shahidzadeh, D. Bonn, K. Ragil, D. Broset, and J. Meunier, Phys. Rev. Lett. **80**, 3992 (1998).